# The case for DTV Access services

**Peter Olaf Looms**
*Danish Broadcasting Corporation (DR)*

**This is the first of three articles on television "access services" to be published in EBU Technical Review.**

**It looks at the current nature of the European Commission's e-Inclusion challenge and provides an overview of the mature and emerging access services that should be considered, while taking national and regional circumstances into consideration.**

## Why access services?

Across Europe, television broadcasters are switching to digital transmissions and, by 2012, the analogue switch-off is expected to be completed in most of the EU's member states. The move to digital production and distribution is allowing broadcasters to enhance the viewing proposition: more television channels, higher quality images with multichannel sound, as well as better ways of finding and watching television programmes. At the same time, going digital holds the promise of making television more inclusive.

Historically, broadcasters have always taken measures to be inclusive. When offering television programming in foreign languages, the content has been localised – using dubbing, lectoring or subtitling – so that viewers could understand what was being said. By also offering access services such as ***subtitles*** for the deaf and hard of hearing, ***visual signing*** for those born deaf, or ***audio description*** for those with visual impairments, broadcasters have tried to ensure that viewers are not inadvertently excluded from being able to watch television.

Currently, as many as 15% of adults in Europe have some kind of functional impairment that has an impact on their ability to watch a TV programme. While progress in the medical field means that some kinds of impairment are less prevalent than in the past, the ongoing increase in life expectancy across Europe brings with it increases in age-related hearing and sight impairments, as well as a reduction of physical capacities such as manual dexterity (being able to handle a remote control).

A less commonly-reported kind of exclusion is social in nature. It relates to immigrants and political refugees for whom watching television in the country or region where they live is one of several means to promote social inclusion and integration. In countries such as Finland and in the autonomous region of Catalonia in Spain, broadcasters are using multilingual subtitles in primetime to address this social challenge.

The UN Convention on the Rights and Dignity of Persons with Disabilities, and European legislation such as Article 7 of the Audiovisual Media Services Directive contain new rules that aim to make audiovisual content increasingly accessible for those with functional impairments. The Article stipu-

lates that governments must encourage media companies under their jurisdiction to do this using access services such as subtitling and audio description. Progress on the implementation of the Directive at national and regional level was reviewed by the Commission at the end of 2009.

While broadcasters are clearly interested in serving their audiences with television programming, they have a legitimate concern to strike a fair balance between the legal and social requirements on the one hand, and technical, economic and logistic implications on the other. The move towards what the European Commission terms "e-Inclusion" has to been seen in the context of the current economic climate and the business models for television that are under severe financial pressure. As a result, broadcast technologists have to come up with viable and cost-effective solutions that help management meet the legal and regulatory requirements.

This is the focus of the present article, which is the first of three articles on DTV access services. It looks at the current nature of the e-Inclusion challenge and provides an overview of the mature and emerging access services that should be considered, while taking national and regional circumstances into consideration.

In the next article, the author will explore some of the central production issues to do with access services, especially the challenge of providing subtitles for the deaf and hard of hearing to go with live television programmes.

In the final article, the author will review the implications of delivering access services – not only with programmes broadcast on digital terrestrial networks but also on other broadcast, IP-based and hybrid delivery platforms. As television viewing increasingly moves from a synchronous to an asynchronous mode (viewers watching what they want, when and where they want, on a multiplicity of devices), this will require product and distribution strategies that build on the "COPE" paradigm (Create Once, Publish Everywhere).

## The nature of the e-Inclusion challenge – the demand side

As part of the author's recent work on access services for digital television, one of the challenges has been a lack of reliable or comparable data on the nature and size of the various groups at risk of being excluded from watching. There is a natural tendency to think that if something cannot be quantified, it does not exist.

What we can do is identify some of the major disadvantaged groups and the nature of the problem they have, when watching television. A summary of such groups is as follows:

- ***Viewers born deaf whose mother tongue is sign language.*** The viewer finds it impossible to understand the sound track of a TV programme.
- ***Deaf viewers (oralists) who lost their hearing in childhood or adulthood.*** The viewer finds it very difficult / impossible to understand the sound track of a TV programme in his / her own language in spite of some degree of lip-reading skills.
- ***Viewers who are hard-of-hearing.*** The viewer has some degree of difficulty in understanding the sound track of a TV programme in his / her own language.
- ***Exclusion of viewers who have difficulty in following spontaneous speech.*** The viewer has some degree of difficulty in understanding the dialogue of a TV programme in his / her own language.
- ***Viewers of TV programmes in a foreign language.*** The viewer has some degree of difficulty in understanding the dialogue of a TV programme in a foreign language.
- ***Young viewers (0-6 years) of TV-programmes in a foreign language.*** The viewer finds it very difficult / impossible to understand a TV programme in a foreign language where interlingual subtitling is offered.
- ***Social exclusion of immigrants or refugees.*** The viewer finds it very difficult / impossible to understand the sound track of a TV programme.

- ***Viewers who have receptive aphasias such as dyslexia and / or cognitive impairments affecting their short-term memory (caused by accident, illness or substance abuse).*** The viewer finds it very difficult / impossible to understand a TV programme in a foreign language where interlingual subtitling is offered.
- ***Viewers who are blind.*** The viewer finds it very difficult / impossible to understand a TV programme with a sound track in his / her own language (original / dubbed) or in a foreign language.
- ***Viewers with visual impairments.*** The viewer finds it very difficult / impossible to understand a TV programme in a foreign language with interlingual subtitling and / or SDH (Subtitles for the Deaf and Hard-of-hearing) for same-language content.
- ***Viewers (often senior citizens) getting started with digital television.*** The viewer finds it difficult / impossible to set up, configure or reconfigure his / her digital TV receiver.
- ***Viewers (after digital switchover) using digital television on a regular basis.*** The viewer finds it difficult / impossible to discover, select and view a given television programme using one or more remote control devices.

The next step is to be able to assess how big these various groups are. We can indicate the approximate size of most of the groups facing exclusion by using the exclusion calculator at the University of Cambridge in the UK. This is based on an extremely large interview survey by Grundy of respondents over 16 years of age in the UK. The interviews were conducted around 1997 and the results published in 1999.

A related study in the USA, using the same questionnaire, gave figures that were about 10% greater than those for the UK. Given the a priori assumption that impairment levels are unlikely to be significantly greater than those of the USA, we can use the UK figures as a baseline to talk about groups at risk across the whole of Europe with a possible variance of ±10%. As far as television viewing is concerned, hearing impairments are regarded as being the most widespread.

*Fig. 1* – taken from a table on the Cambridge University website – shows the range of hearing impairments that impact television viewing for adults in the UK. The prevalence of a given impairment in the UK will be approximately the same in other EU member states.

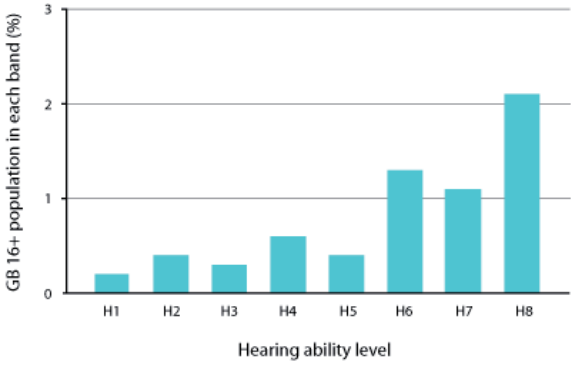
The Grundy study for hearing ability uses 9 self-evaluation categories (H1-H9). Those who are unable to follow a television programme, even when using their hearing aid, would be found in

**Population statistics: Prevalence data**

**Hearing ability level (in increasing order)**

| | |
|---|---|
| H1 | Cannot hear sounds at all |
| H2 | Cannot follow a TV programme with the volume turned up |
| H3 | Has difficulty hearing someone talking in a loud voice in a quiet room |
| H4 | Cannot hear a doorbell, alarm clock or telephone bell |
| H5 | Cannot use the telephone |
| H6 | Cannot follow a TV programme at a volume others find acceptable |
| H7 | Has difficulty hearing someone talking in a normal voice in a quiet room |
| H8 | Has great difficulty following a conversation against background noise |
| H9 | Full hearing ability |

**Ability level is measured with any desired hearing aids.**




Graph showing the distribution of hearing ability, where those with full ability (H9) are not shown.

**Important note**

These hearing ability levels and prevalence statistics are taken directly from the 1996/97 Disability Follow-up Survey (Grundy et al. 1999), which was commissioned by the government to plan welfare support. The GB adult population was 45.6 million people at the time of the survey. Please see the Framework section for more detail.

**Figure 1**
**The prevalence of hearing impairments in the UK**
*Source:* **http://www-edc.eng.cam.ac.uk/betterdesign/usercap/hearing/hearing9.html**

groups H1-H8 (approximately 5.7% of the adult population). There are comparable ability scales for other abilities including mobility, dexterity and seeing. The exclusion calculator on the University of Cambridge website allows for the combination of abilities to calculate figures for those with multiple impairments.

As part of our work on access services across Europe, we have complemented the Grundy study with exclusion categories covering television programmes in foreign languages where some kind of interlingual support is required (dubbing, lectoring or interlingual subtitles). We have also attempted to be more specific about age- and socially-related exclusion in connection with television viewing.

Examples of age-related exclusion are children under the age of 6 (not covered in Grundy) who cannot yet read in their mother tongue and who need dubbing or lectoring in order to follow a TV programme. Examples of socially-related exclusion are immigrants and refugees in various member states and territories within the European Union.

There is a case to be made for covering social exclusion and the use of subtitles in one or more languages for TV programming on main channels to promote social cohesion and defuse potentially divisive population polarization in certain parts of Europe. As mentioned earlier, there are several good examples of social inclusion using television in countries such as Finland and in Catalonia, Spain.

The exclusion calculator mentioned above can be used to identify the approximate numbers of those risking exclusion within a given population. Over time, the prevalence figures will need adjusting.

There are two major demographic trends that have an impact on exclusion and television viewing:

- *the increasing longevity of the European population* – the average life expectancy is increasing, leading to an increase in age-related functional impairments;
- *improvements in healthcare provisions* – leading to a mitigation of inherited impairments (e.g. cochlear sensory implants giving the born-deaf some kind of hearing).

Overall we can expect no significant change in the incidence of functional impairments among the young and middle-aged, but some increase in the proportion of the over-60s with impairments relating to sight, hearing, mobility, manual dexterity or cognition. There are some doubts about the future demand for visual signing for those born deaf, although this is not expected to disappear in the foreseeable future.

In terms of the *expectations* among such groups, claims have been made that there are major differences among the so-called “baby boomers” (those born after the Second World War who will be retiring in the coming 5-10 years). In Western Europe, at least, baby boomers were brought up to expect some degree of public social welfare. This group may well make more vociferous demands for public-health and social-welfare provisions in the coming 10 years, and this could also influence their expectations of access services.

A related phenomenon is the changing expectations of service provision when an access service evolves from being a pioneering service for the few to being a mainstream provision for the many. Initial gratitude changes over time when such services are seen to be a right, not a privilege.

To conclude, the proportion of the adult population with one or more impairments is expected to rise moderately over the next 5-10 years, mainly among those aged over 60. Expectations of access-service provision are likely to increase faster than can be explained by demographic changes alone.

## The nature of the e-Inclusion challenge – the supply side

The supply side covers both the access services themselves and also metrics for assessing their impact. To assess e-Inclusion, statistics are required for both the demand side and the supply side. In a few member states, there are good statistics for access services specified in legislation or by the

regulator. For most member states, however, discussions on e-Inclusion are hampered by inadequate statistics as we noted for demand-side statistics.

For exclusion to be prevented, the following prerequisites have to be met:

- the viewer must be aware of the existence of television programming with an access service relevant to his or her needs;
- the viewer must have the appropriate (digital) receiver to receive the service;
- the viewer must be able to set up the receiver or ask someone else to do so, in order to receive the required access service;
- the viewer must be able to find the programme and access service on the receiver;
- the viewer must have the necessary motivation to use the service and;
- the viewer must be able to derive benefit from the access service.

## What access services are already available?

Across Europe, a range of access services is available in a number of countries. The most widely available, defined in the text box below, are as follows.

- *Subtitles* – "closed" Subtitles for the Deaf and Hard-of-hearing (SDH), "closed" interlingual subtitles and the subtitling delivery methods of teletext and DVB;

### Definitions

**Audio description, AD**

Audio description makes the images of a television programme accessible for people who are blind or visually impaired – the visual is made verbal during pauses in the dialogue. Using words that are to the point, vivid and imaginative, audio description attempts to convey the visual image. Currently AD is offered either as a broadcaster mix (AD with an alternative stereo mix) or as a receiver mix (AD as a monaural channel that is mixed in the digital television receiver).

**Audio subtitles (spoken subtitles)**

An audio channel that reads aloud, interlingual subtitles for viewers who are blind, visually impaired or with reading impairments. This entails either producing an extra audio channel using speech synthesis at the broadcaster or using speech synthesis in the digital television receiver.

**Dubbing**

Replacing voices in foreign language programmes and films with voices in the native language.

**Lectoring (voice-over translation)**

Providing a commentary in the native language which is offered on top of the existing sound track, which is still audible.

**Subtitling**

Subtitles are textual versions of the sound track of television programmes, usually displayed at the bottom of the screen. They can be either interlingual subtitles, where the dialogue in a foreign language is translated into the native language, or intralingual (same language) subtitles where the text is a version of the dialogue, with or without additional information to help viewers who are deaf and hard-of-hearing. Subtitling is known as "Closed Captioning" in some parts of the world.

**Visual Signing**

Visual signing uses movements of hands and arms combined with body language to convey meaning to people who are unable to understand the spoken language. This is a language in its own right, and in a number of European countries is legally recognized as such.

- *Dubbing and lectoring* – commonly termed “voice-overs”;
- *Audio Description* – AD Broadcaster mix, AD Receiver mix;
- *Audio Subtitles* – usually interlingual, spoken subtitles – can involve speech synthesis at the broadcaster (e.g. YLE, Finland) or at the point of use in the viewer’s home (public service broadcasters in the Netherlands);
- *Visual signing* – usually “open” in-vision , but sometimes “closed” opt-in solutions.

Until 2008, there were patchy statistics on the range of access services available in Europe. In response to requests to provide adequate statistics on the availability of mature access services in Europe, the European Broadcasting Union conducted a survey in 2009 with follow-ups planned for the second half of 2010.

The EBU survey includes figures for the following:

- Subtitling in 2007;
- Subtitling in 2008;
- Subtitling of foreign language programming;
- Subtitling of the national language;
- Subtitling delivery methods (Teletext, DVB-subtitles, in-vision);
- Spoken subtitling;
- Signing;
- Audio description.

The figures from the 2009 EBU survey are available from EBU Technical [1] which will also be handling the 2010 survey.

For 2010, the aim is to:

- extend the survey coverage to include responses from as much of Europe as possible;
- extend the questionnaire so it is known which specific delivery-method variant is used for Audio Description, and;
- generally improve the quality control of the figures quoted (percentage of total TV output for specific channels rather than the broadcaster per se).

What is clear from the EBU study, and the DTV4ALL *(see the text box on the next page)* evaluations of mature access services, is that:

- *Subtitling for the deaf and hard-of-hearing is on the increase* – not only in countries such as the UK where there is a 100% target for all the major television channels but also more generally across Europe. DVB subtitles offer the broadcaster greater control over the look and feel of opt-in subtitles than the comparable service using Teletext.
- *Live subtitles represent a significant challenge* – because (i) their production requires a subtitler to “re-speak” the subtitles which are then converted into text using a speech recognition system (which creates a delay of between 5-14 seconds in presenting the subtitles) and (ii) there are re-speaking systems available for only a limited number of European languages. More on this in the second article.
- *Audio description is also making headway,* but is not yet widely available. The fact that a large proportion of the digital television receivers sold since 2009 are able to handle Audio Description (Receiver Mix) is appreciated neither by broadcasters nor the general public. Given that Receiver Mix offers a bandwidth advantage of 200 kbit/s over Broadcaster Mix (where the broadcaster offers two different stereo mixes), this is a source of concern, especially to the

1. *Subtitling amongst EBU Members - Results of the latest EBU Survey into Access Services in Europe*
Edgar Wilson, European Broadcasting Union, Eurovision TV Summit, Subtitling Session, Lucerne, 8 May 2009.

### DTV4ALL

DTV4All is a project funded by the European Commission, under the CIP ICT Policy Support Programme, to facilitate the provision of access services on digital television across the European Union. The project started in July 2008 and runs until the end of 2010.

The project has four main objectives:

- To offer and evaluate mature subtitling, audio description, audio subtitling and signing services in a minimum of four territories within the European Union over a period of at least 12 months;
- To identify improvements to existing access services and ways of addressing the key technical, organisational and legal obstacles to the sustainable take-up of these services in the timeframe, 2008-2010, throughout Europe;
- To identify and prioritise key emerging access services, and the devices and platforms needed to support them for the period 2010-2012, in terms of technological feasibility, perceived value to their intended users and business model viability;
- To make recommendations regarding mature and emerging access services to bodies representing stakeholders in the access service value chain, on the basis of which these bodies can take appropriate action in relevant standardisation bodies.

Website: **http://www.psp-dtv4all.org/**

consumer electronics manufacturers who have made efforts to implement this service in their products.

A major difficulty is finding a means to communicate the presence of Audio Description to the visually impaired. Suggestions have been made to add a short acoustic signal or jingle when a viewer moves the cursor over an EPG entry containing AD, or when zapping to a channel offering AD. More on this in the second article.

- *Audio (spoken) subtitling is also on the move* in countries and territories where subtitles are used for interlingual communication (translating a soundtrack in a foreign language into the local language). Several countries are now offering centrally-produced audio subtitling using speech synthesis and can be regarded as a natural complement to Audio Description (Receiver Mix). There are clear synergies between interlingual subtitling and audio subtitling, and the operational costs of central systems appear to be within the means of most broadcasters.
- *Visual signing is perhaps the most contentious of the mature access services*. In-vision solutions are not generally popular with those who are not deaf. Opt-in solutions such as the one used by DR and TV2 in Denmark can only be offered for programming in standard definition as they require the creation of a virtual channel showing the signer almost the height of the screen as and when required – and for efficient transmission, this may imply the use of statistical multiplexing.

## Which access services are currently going through a "proof-of-concept" evaluation?

Viewers with hearing impairments are currently expected to use Subtitling for the Deaf and Hard-of-hearing (SDH) to make television programmes more accessible. One of the issues with this is that a significant proportion of adult viewers – said to be from 5% to possibly 25% of them – have some kind of reading impairment, or are just slow readers and therefore do not benefit fully from subtitling.

Work is in progress on two fronts to remedy the situation:

1) The first is to offer "clean" or "clear" audio – signal processing of the audio to enhance the intelligibility of the sound. This can be done in the television set and delivered to viewers watching with family members through loudspeakers or headphones, or even through some kind of wireless connection between the television set and the viewer's hearing aid.
2) A second approach is to stretch the video and audio of the television programme without affecting the pitch of the sound track. By doing so, this allows an increase in the time that

**Peter Olaf Looms** is a senior consultant in the commissioning body of DR in Denmark. For the last few years he has been working on access services for digital television so that as many people as possible can get the full benefit from watching television. Much of this work is related to the EU project called DTV4ALL.

In addition to his work at DR, Mr Looms teaches digital media on postgraduate programmes at several universities.

subtitles can be shown on the screen and more time for understanding the spoken dialogue. Solutions of this kind are currently being evaluated by the IRT in Munich and NHK, the Japanese public service broadcaster.

## Conclusions

The digital switchover represents a clear window of opportunity to make television more inclusive, using digital technologies. Considerable progress has been made on a number of fronts in Europe.

Introducing new access services and scaling up the existing access provision will require ingenuity and collaboration among broadcasters in Europe so that affordable and sustainable solutions can be found.

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Editeur Responsable: Lieven Vermaele

Editor: Mike Meyer

E-mail: tech@ebu.ch

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